



Residents' Perceptions of the Visual Quality of On-Site Waste Storage Bins in Kuching

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Abstract

On-site storage of waste can be convenient to the waste generators especially to those who generate large amount of wastes every day. Concerns regarding public health and aesthetics considerations of the on-site storage of wastes have also arisen due to the use of unsightly makeshift containers or open ground storage. There has been extensive research conducted to improve the understanding of aesthetic qualities of natural landscapes. Nevertheless, research on resident's visual preferences and concerns for solid waste management facilities is still limited. Therefore, the ultimate goal of this study is to understand the perceived visual aesthetic quality of on-site storage facilities of wastes at collection points in Kuching District. A survey was conducted in August 2009 using a set of questionnaire consisting of several sections with 60 closed-ended questions, including questions with Likert scales. Since the official privatization of solid waste management in Kuching, the concession company has been providing uniform mobile garbage bins of standard sizes to residents and commercial areas. This has gradually improved the solid waste management systems. In general, the solid waste management problems in Kuching city are perceived to be moderately serious. Other than that only overflowing wastes at containers is the main problem that creates visual pollution. The highest mean ratings/or the visual assessment were 3.43 (physical attribute -clean), 4.60 (feelings – comfortable), and 3.34 (appraisal -attractive). It was also found that the photographs showing the mobile garbage bins provided by the concessionaire had the highest mean ratings for all three scales, i.e. descriptive, affective and appraisal scales.

Keywords: Visual quality, on-site storage, waste bins, solid waste management, Kuching

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1.0 Introduction

Rapid urbanization and increasing urban population growth in Malaysia have implicitly led to the increase of waste volume, particularly municipal waste. According to the Department of Statistics, the Malaysian population in 2008 is 27.73 million. The average annual population growth rate is 4.5 percent and approximately 70 percent of this is urbanized population (UNICEF, 2(04). In the capital city of Malaysia alone, solid waste generated could reach double the amount of 3.2 million tons a year to 7.7 million tons a year over the period of twenty years (Hassan, 2002; Hassan, et al., 2(00). In 2006, the amount of waste generated in Malaysia was 7.34 million tons, which according to Siraj (2006) is enough to fill up 42 buildings of the same size as the Petronas Twin Tower. Unfortunately, the solid waste management technology and system are not developing at the same rate as the growth of population and waste generation rate. This has led to a "severe deficit" and consequently the Local Authorities have problems trying to provide good services according to the current situation (Rojas-Caldelas & Zambrano, 20(8).

The functional elements of solid waste management from the point of generation to the final disposal are categorized into six: (1) waste generation; (2) waste handling and separation, storage, and processing at source; (3) collection,

(4) separation and processing and transformation of solid wastes; (5) transfer and transport; and (6) disposal (Tchobanoglous, Theisen, & Vigil, 1993). For the purpose of this study, the researchers focused mainly on the second element, particularly on the visual quality of on-site storage of waste. On-site storage of waste can be convenient to the waste generators, especially those who generate large amount of wastes every day. However, it has also brought concern regarding public health and aesthetics considerations. The use of unsightly makeshift containers or open ground storage causes visual pollution (Tchobanoglous, et al., 1993) which impairs the image of a city.

Visual pollution is an aesthetic issue. It refers to the impacts of pollution that could damage our ability to enjoy a view, which includes visibility or limits our ability to view distant objects. Visual pollution is also used broadly to cover more subjective issues such as visual clutter, structures that encroach otherwise appealing scenes, as well as graffiti and other visual destruction (Stapleton). Human, as one of the components of the biodiversity, understand their environment through what they see and therefore, the perceptions of and preferences for the visual environment are part of what makes and environment psychologically comfortable (Xu, 1995). Environments that are considered to have high aesthetic value can significantly increase the general well-being of individuals who are in contact with the environment (Galindo & Rodriguez, 2000; Tweed & Sutherland, 2(07).

There has been extensive research conducted to improve the understanding of visual aesthetic qualities of landscapes (Arriaza, Canas-Ortega, Cafias-Maduefio, & Ruiz-Aviles, 2004; Bulut & Yilmaz, 2008; Coeterier, 1996; Priestley & Evans, 1996; Wong & Dornroes, 2(05), which more often than not examined visual preferences for the natural landscape. On

the other hand, research on resident's visual preferences and concerns for solid waste management facilities is still limited. For a more effective solid waste management practice, it is essential to understand how people perceive the visual quality of on-site storage facilities of wastes. This study therefore seeks to answer the following questions:

The ultimate goal of this study was to understand the perceived visual aesthetic quality of on-site storage facilities of wastes at collection points within Kuching City. To achieve this goal, certain objectives needed to be accomplished:

I. To study the design and types of bins used by the public for on-site storage of domestic wastes;

II. To investigate the problems of solid waste management systems as perceived by the public; and

What are the types of waste bins used by the public for on-site storage of domestic wastes?

How do the public perceive the solid waste management problems? and

How do the public perceive the visual quality of on-site waste containers?

III. To investigate the visual quality of on-site waste containers as perceived by the public.

2.0 Literature Review

Visual assessment methods have been utilized by many researchers to improve the understanding of aesthetic qualities of landscapes (e.g. Coeterier, 1996; Arriaza et al., 2004; Bulut and Yilmaz 2008). A study done by Coeterier (1996) summarized a 20 year study on landscape perception and evaluation. It was pointed out that environmental attributes (in the case of landscape assessment) did not only determine perception but also acted as qualities, which determined landscape evaluation.

Visual preference studies have also evolved from assessing landscape to assessing other forms of urban design (e.g. Nasar and Hong, 1999), and infrastructure such as electrical transmission line (Priestley and Evans, 1996) and urban automated transportation system (Bernasconi et al., 2009). In a study of visual preferences for urban signscape, Nasar and Hong (1999) adapted similar methods used in assessing scenic beauty of landscapes and concluded that, "empirical data on human responses can build a knowledge base to guide development of appearance regulations and review".

Typically, two types of approaches have been adopted in visual assessment, expert approach and the perception-based approach. According to Daniel (2001), in the case of visual landscape assessment, expert approach "translates biophysical features of landscape into formal design". On the other hand, perception-based approaches utilize biophysical features of a landscape as stimuli that induce aesthetically relevant psychological responses through relatively direct sensory perceptual processes and/or through intervening cognitive constructs. Perception based approaches utilize human

perceptual judgments as indicators of visual aesthetic quality (Bernasconi et al., 2009)

The principle of perception is about how we make sense of the information that we receive through the sensory organs of the body. While sensation is the information that we receive directly from the sense organ, perception involves analyzing and interpreting that information (Hayes, 1994). While there are arguments regarding the reliability and validity of both approaches, a study by Priestley and Evans (1996) in assessing resident's perception of electrical transmission line found that lay people's appraisal of visual impacts did not necessarily coincide with the assumptions made by experts. Therefore, it is crucial to also understand the perceptions of the non-experts in planning and managing a place.

3.0 Research Methodology

3.1 Study Area

Kuching city, located in East of Malaysia, is the fourth largest city of Malaysia. The city of Kuching lies within the district of Kuching which covers an area of 1,863 square kilometres (719 sq mi). The district of Kuching is administered by three local governments, namely Kuching North City Hall (DBKU), Kuching South City Council (MBKS) and Padawan Municipal Council (MPP).

The solid waste management in Kuching city is taken care of by Trienekens (Sarawak) Sdn. Bhd., the operating company appointed by Sarawak Waste Management Sdn. Bhd. Since 1999, the company has been providing uniform mobile garbage bins to residents and commercial areas. This is one of its strategies of implementing integrated solid waste management and to provide satisfactory services to city dwellers.

3.2 Photographic Survey

The first step of the research was photographic survey of the type of waste bins in Kuching city. Photographs of bins at different type of residential areas and commercial areas were taken to identify the type of bins available for users. The photographs were then categorized according to the type of bins

For the visual assessment, six photographs of different types of waste receptacles were used to assess the residents' perceptions of the visual quality of each scene. The selected photographs were used for the visual appraisal section of the questionnaire. The breakdown of this section was based on (a) descriptive scales, measuring the physical attributes of the selected scenes; (b) affective scales, mainly to measure the reactions or mood of the respondents when exposed to the scenes; and (c) appraisal scales, indicating the aesthetic value and quality of the scenes (after Galindo & Rodriguez, 2000). The respondents assessed the photographs one at a time to avoid making comparisons.

3.3 Data sampling

The total number of household in the three councils in Kuching is approximately 85,000 with

a total number of approximately 560,000 inhabitants. Having considered Yamane's (1967, 1983) sampling method, a total of 400 respondents is required for this study.

The sampling procedure for this study was clustered random sampling whereby the participants were from areas under the jurisdiction of DBKU, MBKS and MPP. A list of municipal waste collection areas were obtained from the local authorities. Each area consisted of several residential areas and each area was assigned codes. The codes were listed in Microsoft Excel and 5 areas were randomly selected from the lists giving a total of 15 areas.

3.4 Data Analysis

Statistical analyses were conducted using statistical software, SPSS Version 17. Descriptive statistics were used to organize and present the respondents' demographic profile and responses towards the solid waste management problems as well as the visual quality ratings.

4.0 Results And Discussion

4.1 Demographic profile

The proportion of male and female among the respondents is 48.4 percent males and 51.6 percent females. The respondents were represented by the major ethnic group in Malaysia, Malay (26.0 percent), Chinese (48.9 percent), Indian (1.5 percent), Iban (1.4 percent), Bidayuh (9.0 percent), Melanau (1.4 percent) and other minor ethnics (1.2 percent). 65.5 percent of the respondents were between 20 to 39 years old. 25.1 percent of the respondents received upper secondary education, 20.2 percent received certificate or diploma while 30.9 percent were university graduates. The survey was conducted at different types of residential areas. Majority of the respondents resided in terraced housing areas (68.6 percent) followed by 10.2 percent living in Kampung houses. The rest were semi-detached, bungalow, flats and shop houses.

4.2 Design and types of bins used as on-site waste receptacles

The management of solid waste in Kuching, the capital city of Sarawak, is taken care of by Trienekens (Sarawak) Sdn. Bhd. Trienekens is the operating company appointed by Sarawak Waste Management Sdn. Bhd. Trienekens and was awarded a 25 years concessionaire for the collection and treatment of solid wastes within the jurisdiction of the three local councils of Kuching (Tang, Soon, & Larsen, 2003).

Since the official operation in June 2000, the company has been providing uniform mobile garbage bins (MOB) of standard sizes to residents and commercial areas. The residents in Kuching were provided with 120-litres MOB's whereas shop-houses and flats were provided with 240-litres MOB's or 660-litres MOB's. Table I summarizes the

dimension, capacity and other specifications of the MOB. The company also provides 1100-litres and 10m³ Roll-on-roll-off (RoRo) containers to markets, industrial areas and shopping centers. Other than that, Trienekens is responsible for educating the residents the right way of taking care of the MOB. To date, this system has improved the solid wastes collection system especially in residential areas.

Table 1: Types and designs of Mobile Garbage Bins

Capacity (Liter)	Dimension (mm)	Other specifications
120	475 x 480 x 885	• Two / four wheeled
240	660 x 587 x 1000	• Compatible with the automatic lifter of collection truck
660	1360 x 770 x 1180	• High density polyethylene (HDPE) resin

4.3 Public's perceptions of the problems of solid waste management system

The second objective of the study was to investigate the problems of solid waste management (SWM) systems as perceived by the public. Respondents were asked to rate the seriousness of the problems at their residential areas based on a scale of 1 to 5. The problems were identified based on previous interviews with the public health officers of all three local councils. Generally the respondents rated the SWM problems in the residential areas as moderately serious (Table 2).

Since the privatization of the SWM, the concessionaire implemented an integrated system to provide a more efficient and effective service to the public. The introduction of the mobile garbage bins (MGB) usage has improved the collection system as well as the aesthetics problems (Ng, 20(9)). The MGB is designed to be compatible with the automatic bin lifter of the collection truck. This ensures time-efficient collection and proper handling of the MGBs which reduces damage of bins during collection. At terraced housing areas, SWM problems were minimal as the residents were responsible of taking care of their own MGB. On the other hand, for communal bins such as 660L MGB and RoRo containers, problems such as overflowing waste, indiscriminate waste disposal, foul odor, leachate and scavenging had been an unsolved problems for the local authorities (Ng, 2(09)).

There are also several factors to be considered for on-site storage of wastes such as the types of containers used and the container locations. Improper management of waste containers could cause public health and aesthetic issues. Aesthetics issues are related to the production of odors and unsightly conditions when care is not given to the cleanliness of the waste containers and its surroundings (Tchobanoglous, et al., 1993). In this study, more than 60 percent of the respondents disagreed that problems such as damaged bins, exposed waste containers (without lids), usage of non-standardized waste containers and

unsuitable location of waste containers caused visual pollution (Table 3). However, 52.8 percent respondents did think that overflowing wastes at waste containers caused unpleasant sight. From the results, it can be said that the residents' perceptions of aesthetics quality varied according to their knowledge, culture and socio demographic background. There are generally two factors as to why we could expect these perceptions to vary across socio demographic groups (Bales, 1985). Firstly is the difference in exposure towards the problems, for instance, the type of residence and occupations. Secondly is the difference in taste, which is entirely subjective.

Table 2: Problems of SWM at residential areas

Item	Problems of SWM	*Seriousness (percent)				
		1	2	3	4	5
1	Overflowing wastes at waste containers	14.1	15.6	33.6	21.7	15.1
2	Vandalism of waste containers	21.4	25.3	30.7	12.7	10.0
3	Littering around waste containers	12.4	19.5	26.3	26.8	15.1
4	Inappropriate location of containers	21.7	26.5	31.6	14.4	5.8
5	Foul odour	14.4	18.0	31.6	19.2	16.8
6	Visual blight at dumping sites	17.0	17.5	29.9	21.9	13.6
7	Misuse of on-site disposal facilities	23.1	32.1	23.8	13.6	7.3
8	Failure of on time collection	14.6	25.5	29.7	19.7	10.5
9	Residents are not concern about the cleanliness of on-site waste containers	12.2	17.3	34.8	21.9	13.9
10	Lack of enforcement and monitoring by authorities	7.8	17.0	37.2	22.1	15.8

* Scale for seriousness of the problems:
 1 Not serious – 3 Moderate – 5 Very serious

Table 3: Problems of SWM that cause visual pollution

Item	Problems of SWM	Agree (%)	Disagree (%)
1	Damaged waste containers	37.7	62.3
2	Exposed waste containers (without lids)	37.0	63.0
3	Usage of non-standardized waste containers	16.1	83.9
4	Overflowing wastes at waste containers	52.8	47.2
5	Improper location of waste containers	14.8	85.2

4.4 Visual assessment of on-site waste storage containers

The third objective of this study was to investigate the visual quality of onsite waste containers as perceived by the residents in Kuching. The assessment was based on three scales, (a) descriptive scales, measuring the physical attributes of the selected scenes; (b) affective scales, mainly to measure the reactions or mood of the respondents when exposed to the scenes; and (c) appraisal scales, indicating the aesthetic value and quality of the scenes (after Galindo & Rodriguez, 2000).

Figures 1 to 6 are the photographs and the mean ratings for each scale. Figures 1 to 3 show three different types of on-site waste receptacles commonly used as domestic waste receptacles at residential areas. Figures 4 to 6 are the communal bins that are commonly used at residential flats, commercial areas and shophouses. Figures 2 and 4 have the highest mean ratings for all three scales. The waste containers in Figures 2 and 4 are the 240L and 660L were mobile garbage bins provided for the residents in Kuching. On the other hand, the waste bin in Figure 1 was made of concrete material and is fixed to the ground. The surroundings of the waste bin looked filthy. Figure 6 has also the lowest mean ratings probably due to the overflowing of waste around the waste bins which create unpleasantness to the viewers.

While the perceptions of cleanliness and attractiveness is entirely subjective, it is still deemed possible that there is a collective consensus in what people might consider as clean or dirty, attractive or ugly (Carlson, 2000). Visual perception is a function of the interaction between people and the environment. Zube, Sell, & Taylor (1982) proposed that there were three main components for visual perception: human, the visual resource and the interaction. The interaction component is what results in the outcomes of the response human has on the resources.

There were several reasons identified by the researchers as to why there were differences in terms of public responses and their behaviors toward environmental problems. One of the main reasons was that the public may take for granted the responsibility of protecting the environment because of the assumptions that the government had taken care or might take care of the responsibility. Other than that, the public might not have access to sufficient information and knowledge about the ways of taking part and be more environmental friendly (Dunlap, 1989 in Scott & Willits, 1994). Nevertheless, in depth studies need to be conducted to study in our local context, the factors that influence the attitudes and behaviors of the public towards the visual quality of the environment.



Figure 1: Mean ratings ^a1.34, ^b2.12, ^c1.31



Figure 2: Mean ratings: : ^a3.43, ^b4.60, ^c3.34



Figure 3: Mean ratings: ^a1.91, ^b2.16, ^c1.74 77

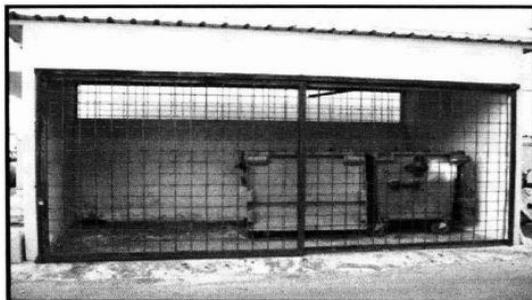


Figure 4: Mean ratings: ^a2.94, ^b3.84, ^c2.84



Figure 5: Mean ratings: 81.23, b1.74, c1.22



Figure 6: Mean ratings: "1.10, b1.44, c1.10

6. Conclusions

The general objective of the study was to investigate the perceived visual aesthetic quality of on-site waste storage facilities. Since the official privatization of SWMinKuching, the concession company has been providing uniform mobile garbage bins(MGB) of standard sizes to residents and commercial areas. This has gradually improved the SWM systems. In general, the solid wastes management problems in Kuching city are perceived to be moderately serious. Other than that only overflowing wastes at containers is the main problem that creates visual pollution. It was also found that the photographs showing the MGBs have the highest mean ratings for all three scales, which are the descriptive, affective and appraisal scales.

Nonetheless, there are other factors that could influence the residents' perceptions and attitudes towards the solid waste management problems, and also towards the visual

aesthetics quality of on-site waste storage facilities. Therefore, further studies are necessary to investigate the reasons for the perceptions and attitudes to vary.

In addition, people often overlooked the aesthetics problems of on-site waste storage facilities. Planners often emphasized on improving the technical elements of an integrated solid waste management system, such as improving the waste collection system so as to minimize collection time in order to cater for larger collection areas. Having state-of-the-art waste collection and disposal facilities is not the ultimate solution for solid waste management problems. It has to be the integration of all the functional elements of the solid waste management system. Therefore, it is important to understand the behavior and perceptions of residents towards the visual aesthetic quality on-site waste storage facilities.

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